

The National Space Grant Office requires two annual reports, the Annual Performance Data Report (APD – this document) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.

Oklahoma Space Grant Consortium
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Consortium URL: <http://okspacegrant.ou.edu/>
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PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The Oklahoma Space Grant Consortium is a Designated Consortium funded at a level of \$575, 000 for fiscal year 2014.

PROGRAM GOALS

Consortium Goals and SMART Objectives from your 2010 base proposal and budget (or as amended in subsequent submissions)

OKLAHOMA GOALS FOR NASA OUTCOME 1

WORKFORCE DEVELOPMENT GOAL: *To enhance state economic and workforce development in aeronautics and space, while providing applied learning experiences for students and faculty.*

SMART Objectives to achieve Goal:

- Develop linkages between Oklahoma aerospace industry, researchers, and students that foster the creation of market driven technology products.
- Award competitive grants/fellowships to faculty and diverse student populations to facilitate hands-on learning related to state economic and workforce development.

- Provide University Career Services personnel support to increase their knowledge of employment opportunities within aerospace-related industry and at NASA Centers.

FELLOWSHIP GOAL: *To use the NASA mission, facilities, human resources, and programs to provide information, experiences, and research opportunities for students at all levels to support the enhancement of knowledge and skills in the areas of science, technology, engineering, and mathematics.*

SMART Objectives to meet Fellowship Goal:

- Educate students at all levels by encouraging and supporting interdisciplinary and multi-disciplinary research experiences and education programs.
- Provide support to the science and technology workforce pipeline by including greater participation of individuals who are underrepresented in science, mathematics, engineering and technology, in NASA student programs.
- Increase the number of NASA student support opportunities through partnerships and industry collaboration and cooperation.

HIGHER EDUCATION GOAL: *To support Higher Education research capability and opportunities that attract and prepare increasing numbers of students and faculty for NASA-related careers.*

SMART Objectives to meet Higher Education Goal:

- Use NASA mission-based programs to demonstrate the integrated education applications of science, technology, engineering, and mathematics for use in student learning activities.
- Provide access to and promote utilization of NASA-related materials and information resources.
- Increase the number and diversity of students and faculty from underrepresented and underserved communities in NASA-related STEM fields.

RESEARCH INFRASTRUCTURE GOAL: *To establish OSGC as a valuable State resource and catalyst for aeronautics and space-related research, education, and state economic and workforce development.*

SMART Objectives to meet Research Infrastructure Goal:

- Create and foster opportunities for faculty and student research at all OSGC affiliates in areas related to NASA's strategic interests.
- Develop and foster interdisciplinary programs to assure the development and transfer of publications in aeronautics and space-related research and education.
- Leverage Consortium and State strengths to meet academic needs and the agenda for economic development.

OKLAHOMA GOALS FOR NASA OUTCOME 2

PRECOLLEGE GOAL: *Increase the number of teachers and students, especially those in underserved and underrepresented communities, who are involved in NASA-related education opportunities.*

Objectives to meet Precollege Goal:

- Develop opportunities for elementary and secondary education teachers to learn effective use of NASA-content, STEM based, materials and programs in the classrooms.
- Introduce students to Space Exploration to encourage an interest in STEM disciplines.

OKLAHOMA GOAL FOR NASA OUTCOME 3

INFORMAL EDUCATION GOAL: Improve public understanding and appreciation of science and technology, including NASA aerospace technology, research and exploration missions.

SMART Objective to meet External Relations Goal:

- Provide instructional materials and technologies derived from NASA research and scientific activities that meet the needs and requests from within the community.

PROGRAM/PROJECT BENEFIT TO OUTCOME (1, 2, & 3)

Provide concise, meaningful highlights or anecdotes (no more than three) that are directly related to work completed in 2013, highlighting student and/or project accomplishments. Specify alignment to an Outcome.

PROGRAM ACCOMPLISHMENTS

Refer directly to the consortium goals and SMART objectives in your 2010 base proposal when describing your accomplishments.

Outcome 1: *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals: (Discussion of achievements and progress related to your Fellowship/Scholarship, Higher Education and Research Infrastructure programs). (Employ and Educate)*

Highlight 1: A **Southwestern Oklahoma State University** student went to NASA Langley Research Center for a second summer and was supported by LARRS. Jennifer Stout, a female Computer Science student worked with the Media Solutions Branch to set up a system for capturing and storing a variety of imagery, including graphic, photographic and video image files so that they may be accessible not only at Langley, but throughout the Agency. After graduation, she became a full time permanent hire at Langley.

Highlight 2: For the second summer in a row, Jared Christen, a 2015 graduate of **The University of Oklahoma** was selected as an intern at NASA's Jet Propulsion Laboratory in Pasadena, CA. For ten weeks in the summer of 2014 Jared worked under the direction of David Henriquez of the Simulation and Support Equipment group. His work involved

updating ground test software written for the Mars Science Laboratory mission (including the Curiosity Rover), and reused on the Soil Moisture Active Passive mission, which is an Earth observation satellite which launched October 2014. As a direct result of his internship at JPL and with the highest recommendations from David Henriquez, Jared has been hired full time at Google in Mountain View California. His work at JPL prepared him for his position as Systems Engineer at Google beginning August 1, 2015.

Highlight 3: Southwestern Oklahoma State University Engineering Technology major Nick Rymer continues a summer internship for the third year at NASA Langley Research Center with his mentor, Dr. James E. Hubbard, Jr. They are working with Arduino micro-controllers, way point programming and GUI for microkopter first-responder Unmanned Aerial Vehicles.

Outcome 2: *Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty:* (Discussion of achievements primarily focused on your Higher Education programs not discussed in Outcome 1 and your Precollege programs). (*Educate and Engage*)

Highlight 1: The X-Hab Academic Innovation Challenge is in its sixth consecutive year. In the last five years, the X-Hab program has produced twenty-four separate university deep space habitat studies, and Oklahoma State University's proposals have been selected to participate in the program every year, *the only university to do so*. The program has included undergraduate students from Mechanical and Aerospace Engineering, Architecture and Architectural Engineering, Biosystems and Agricultural Engineering, Industrial Engineering, Electrical and Computer Engineering, Housing and Interior Design, and Aviation Education. Since the first OSU X-Hab program, over 200 students have been involved as part of class projects with a broad diversity of academic level, major, gender and race. The program has resulted in the development of the **Space Habitat and Architecture Research Center (SHARC)**, that includes complete systems for habitability studies for NASA and others, including the Stafford Deep Space Habitat (SDSH), the Reconfigurable Habitat (ReHAB) Mars lander, and the deployable greenhouse analog for food production on long-duration exploration missions dubbed OASIS (Organics and Agricultural Sustainment Inflatable System). This living laboratory provides a unique resource for students. The High School Space Habitat Innovation Challenge along with X-Hab Unbound uses the currently built transit module and surface habitat to allow K-12 students to be an "astronaut for a day," expanding their interest in STEM careers in general and NASA in particular.

Highlight 2: For the *twentieth consecutive year*, **Mission to Planet Earth (MTPE)** was conducted by the lead office, **The University of Oklahoma**. Participants included two pre-service STEM teachers competitively selected from each of the eight academic affiliates. The ten day, summer in-residence institute, utilized NASA content, facilities, and resources to teach these students how to utilize the excitement of aviation and space to Educate and Inspire their future students. The Department of Education Oklahoma Common Core provides the foundation for the institute curriculum. Throughout the ten days, teachers learn concepts in science, technology, engineering and mathematics related

to NASA content, resources and facilities, they are taught the engineering design process, and are provided a new iPad for their future teaching experiences.

Outcome 3: *Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission: (Achievements and progress of Informal Education programs). (Engage and Inspire)*

Highlight 1: Over 300 students and teachers participated in **Speedfest V**. Recruiters from the aerospace industry are very positive about the experience gained by the college students. One engineering manager from a major aerospace company described the experience; "We had specifically come to support some of our future employees (and see how they do under a little bit of stress), but saw a rigorous and realistic design program. In some cases, it could be more rigorous than the real thing in much of industry." The event at the high school level has been described by multiple teachers that have participated as "life changing" for high school students interested in STEM (particularly Aeronautics and Astronautics.) The teachers shared stories of students who had no intention of going to college, but after competing in Speedfest, they not only will go to college, but will be majoring in aerospace engineering. 3 of these students are now enrolled in college. Spectators at the Speedfest events number in the thousands, and feedback is very positive.

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

- **Student Data and Longitudinal Tracking:** Number of program student participants employed by NASA, aerospace contractors, universities, and other educational institutions; Number of undergraduate students who move on to advanced education in NASA-related disciplines; Number of underrepresented and underserved students participating.

Outcome #1 (employ and educate)

- 82 students took next step in FY14 (SG participation supported from FY06-FY14 funds)
 - 11 are pursuing advanced degrees in STEM disciplines
 - 1 is seeking a STEM position
 - 2 accepted STEM positions at NASA contractors
 - 38 accepted STEM positions in industry
 - 3 accepted STEM positions in K-12 academia
 - 3 accepted STEM positions in academia
 - 24 went on to positions in non-STEM disciplines
- Student Data and Longitudinal Tracking:

Student Data and Longitudinal Tracking: During the FY14 program year 11 students are pursuing advanced degrees in STEM disciplines, 1 is seeking a

STEM position, 2 accepted STEM positions at NASA contractors, 38 accepted STEM positions in industry, 3 accepted STEM positions in K-12 academia, 3 accepted STEM positions in academia, and 24 went on to positions in non-STEM disciplines. The remaining students have not yet received the degree that they were pursuing while they received their Space Grant award.

- **Minority-Serving Institution Collaborations:** Summarize interactions. Reference the names of projects with MSI collaborations.

The Oklahoma Space Grant Consortium embraces diversity in our Consortium membership: five of our eight university members are minority serving institutions: **Langston University** (Oklahoma's only HBCU), **Cameron University**, **East Central University**, **Southwestern Oklahoma State University**, and **Southeastern Oklahoma State University**. Southeastern has the highest number of Native Americans students registered of any other public institution within the state. The Cheyenne Arapaho College, although not yet accredited, is hosted on the Southwestern Oklahoma State University (SWOSU) campus.

Three major annual OSGC programs involve every one of the eight academic affiliates with each of the institutions competitively selecting two student participants: The **Summer Geospatial Institute** offered by the **Center for Spatial Analysis**, **Mission to Planet Earth Summer Teacher Institute**, conducted by **The University of Oklahoma**, and **NASA Center Site Visits**, also led by **The University of Oklahoma**. Thus, there is on-going, strong interaction with the minority serving institutions within OSGC.

- **NASA Education Priorities:** *Accomplishments related to the "Current Areas of Emphasis" stated in the 2010 Space Grant solicitation. Report on areas that apply to work proposed in your proposal and budget.*
 - Authentic, hands-on student experiences in science and engineering disciplines – the incorporation of active participation by students in hands-on learning or practice with experiences rooted in NASA-related, STEM-focused questions and issues; the incorporation of real-life problem-solving and needs as the context for activities.

SWOSU and **Cameron University** both had teams that competed in the *NASA Human Exploration Rover Challenge* (Formerly Moonbuggy) at NASA Marshall Space Flight Center. Students built vehicles that were powered by one male and one female student, and traversed a series of obstacles in a course.

The **Southern Nazarene University Summer Research Experience** provided four first- and second-year students with hands-on research experience for six weeks in 2014. In one project, two students studied ways to synthesize nanoparticles and their ability to prevent the growth of bacteria. This is a multidisciplinary project that was mentored by two chemistry professors and one biology professor.

Frontier Electronic Systems (FES) is an OSGC Industrial Affiliate and has been offering internship opportunities to OSGC students for now over a decade. It is the most successful internship program offered by OSGC in terms of not only providing real-world experiences for students, but also in terms of placement. To date over 1/3 of the OSGC/FES internships have resulted in permanent hiring of the student

- Diversity of institutions, faculty, and student participants (gender, underrepresented, underserved).

OSGC is a diverse organization geographically, demographically in terms of students and faculty, and academically spanning community colleges, regional universities, research universities, science museums, and K-12 STEM education organizations. All eight academic affiliates are required to make competitive awards, at a minimum, to closely reflect their campus demographics for underrepresented minorities and gender. This also includes selection of participants for the three consortium-wide programs addressed above within the section: Minority-Serving Institution Collaborations.

- Engage middle school teachers in hands-on curriculum enhancement capabilities through exposure to NASA scientific and technical expertise. Capabilities for teachers to provide authentic, hands-on middle school student experiences in science and engineering disciplines (see above).

Robotic kits were provided to 24 students for the **2014 Summer Science Academy** held on the campus of **Cameron University**. The students built and programmed the robots, and increased their interest in STEM careers.

- Community Colleges – develop new relationships as well as sustain and strengthen existing institutional relationships with community colleges.

We currently have projects with **Redlands Community College** and **Tulsa Community College** to enhance our recruitment efforts in the STEM sciences. Additionally, we have active informal outreach efforts with **Oklahoma City Community College** and **Rose State College** to assist Associate degree graduates.

- Aeronautics research – research in traditional aeronautics disciplines; research in areas that are appropriate to NASA's unique capabilities; directly address the fundamental research needs of the Next Generation Air Transportation System (NextGen).
- Environmental Science and Global Climate Change – research and activities to better understand Earth's environments.
- Enhance the capacity of institutions to support innovative research infrastructure activities to enable early career faculty to focus their research toward NASA priorities.

This is another area of emphasis of the OSGC. Some OSGC funding was made available to faculty identified research and technology projects related to NASA interest areas. Preference was given to projects that involve Oklahoma industries, particularly small manufacturers who do not have easy access to engineering support

IMPROVEMENTS MADE IN THE PAST YEAR

Succinctly describe improvements and/or adjustments made last year that demonstrate significant change(s) within the consortium. The improvements and/or adjustments that brought about change may have been in management, resource allocation, project design, project evaluation, etc.

Two significant changes were made in the past year to the **Geospatial Summer Institute**... The summer institute was revised to a mixed model with online courses and a one-day symposium with a keynote speaker and student presentations. Course discussions took place on Facebook.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

List the institutions that comprise the consortium; include the name, type of institution, key characteristics, and role.

OSGC represents a state-wide partnership of universities, State Government, City Government, industry, an aerospace education organization, and an air and space museum. These members work together to enhance opportunities for Oklahomans to understand and participate in NASA's Mission by supporting programs in science, technology, engineering, mathematics, and other aeronautics and space-related disciplines throughout the State

A representative from each of the affiliates comprises the Advisory Committee which meets twice a year at the lead institution. In addition, conference calls are conducted several times a year for input to program direction to meeting the changing needs of NASA, the State, economic environments, and funding opportunities to leverage funding.

University Affiliates

- The University of Oklahoma – lead institution
- Oklahoma State University
- Cameron University
- Langston University – a Historically Black College and University
- East Central University
- Southeastern Oklahoma State University
- Southern Nazarene University
- Southwestern Oklahoma State University

Academic Affiliates

- Applications Engineering Programs
- Center for Spatial Analysis

Industrial Affiliates

Frontier Electronic Systems Corporation
Science Applications International Corporation

Informal Science Education Affiliates

Tom Stafford Air & Space Museum
STARBASE Oklahoma

City Government Affiliate

Norman Economic Development Coalition